REMARKS

The Applicants appreciate the Examiner's thorough examination of the subject application and the indication that claims 54-56, 58, 61, 63-68, 70, and 71, if rewritten in independent format, would be in a condition for allowance. Applicants request reconsideration of the subject application based on the following remarks.

Claims 51-76, 118, 119, and 121-124 are currently pending in the application. Claims 51, 53-58, 75, 118, and 119 have been amended and claim 124 has been cancelled. Support for the amendments can be found throughout the specification. No new matter has been introduced by the instant amendments.

Applicants also wish to thank Examiner Alejandro for his helpful comments during a personal interview conducted on February 23, 2004, with the undersigned agent. During the interview, the differences between coprocessing methods of composite SPEM formation claimed by the instant invention and traditional imbibing methods were discussed.

It also is submitted that the within amendments may be properly entered at this time, i.e. after final rejection, pursuant to 37 CFR §1.116, because the amendments do not raise any new issues or require a new search, and they reduce issues for appeal. Indeed, it is believed that the within amendments place the application in condition for allowance. Accordingly, entry of the within amendments is earnestly solicited at this time.

Referring now to the outstanding Office Action, claims 51-53, 57, 59-60, 62, 60, 72-76, 118-119, and 121-123 were rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over Kindler (U.S. Patent 4,865,930) in view of Arnold (U.S. Patent 4,714,663).

The Office takes the position that:

> The instant application is directed to a method of producing a composite solid polymer electrolyte membrane wherein the inventive concept comprises the specific materials therefore.

Office Action of November 24, 2003 at page 3.

Further, the Office has asserted, in the Response to Arguments, that:

> [I]t is positively contended that sequence of adding ingredients to obtain the most satisfactory mixture of constituents is within the expected skill and judgment of those of ordinary skill in the art and such choice of sequence does not involve invention in making the mix of the claimed constituents to then casting or extruding it. Further, the transposition of process steps or the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result does not patentably distinguish the process. Additionally, the performance of two steps simultaneously, which have been previously been performed in sequence is obvious; also, the combination of separate process steps into a unitary process is obvious.

Office Action of November 24, 2003 at page 6.

The rejection is traversed.

The cited references, whether considered alone or even in combination, do not teach or suggest the processes of the present invention.

For instance, Kindler, et al, teach a conventional method of preparing composite materials which methods have been used extensively to prepare a variety of composite materials. More particularly, the Kindler method includes the steps of (1) providing or preparing a porous substrate film which has an unfilled porous structure; (2) infiltrating the pores of the substrate with a second material; and (3) collapsing the porous substrate by drying or stretching in order to entrap the second material. Such methods are frequently time intensive, in large part, because the porous polymer film must be prepared first; then infiltration by the second material into the pores of that polymer film frequently requires several hours or days. As a consequence, copious waste streams are generated, thus presenting yet another disadvantage of this and other conventional processes.

In contrast, the methods of the present invention obviate the need to separately prepare a porous polymer scaffold and then infiltrate the porous structure with a second material. More particularly, as provided in claim 51, a homogeneous mixture of the substrate polymer and the ion conducting material is prepared and thereafter cast or extruded to provide the composite SPEM. That is the mixture of substrate and ICM is cast or extruded. The cited references, taken alone or even in combination, do not teach or suggest such a process step.

Each of independent claims 51, 118, and 119 provides a method of preparing composite solid polymer electrolyte membranes and each recites that novel synthetic step that embodies the inventive concept, e.g., mixing the substrate polymer and the ion-conductive material to form a homogeneous mixture and thereafter forming the composite SPEM from the mixture.

Thus, for example, claim 51, as amended, provides a method of preparing a composites **solid** polymer electrolyte membrane (SPEM) comprising a porous polymer substrate interpenetrated with an ion-conducting material. The instant method comprises the steps of:

1. preparing a homogeneous mixture of the substrate polymer and the ion-conducting material; and thereafter
2. casting or extruding the composite SPEM from the mixture prepared in step 1.

Similarly, claim 118 provides a method of preparing a composite **solid** polymer electrolyte membrane (SPEM) comprising a porous polymer substrate interpenetrated with an ion-conducting material. The instant method comprises the steps of:

1. preparing a homogeneous mixture of the substrate polymer and the ion-conducting material **in a common solvent**; and thereafter
2. casting or extruding the composite SPEM from the mixture prepared in step 1.

Claim 119 provides a method of preparing a composite **solid** polymer electrolyte membrane (SPEM) comprising a porous polymer substrate interpenetrated with an ion-conducing material. The instant method comprises the steps of:

1. preparing a homogeneous mixture of the substrate polymer and the ion-conductive material; and thereafter

2. casting or extruding the composite film **directly from the mixture** prepared in step 1.

Thus, each of the methods of forming a composite solid polymer electrolyte membrane provided by the instant application comprises preparing a homogeneous mixture of the substrate polymer and the ion-conductive material and thereafter casting, extruding, or otherwise forming the composite film from the mixture of the polymer substrate and the ion-conductive material.

None of the references cited, taken alone or in combination, teach or suggest forming a mixture of the ion-conductive material and the polymer substrate and then forming a composite interpenetrated film from such a mixture. In contrast, neither of the references relied upon by the Office Action teach or suggest premixing of a support polymer and an ion-conducting material prior to film formation. Indeed, the skilled artisan would not event be motivated to do so in view of the disclosure provided by those references.

In contrast to the present invention, Kindler recites methods of making ion-conductive and gas permeable membranes comprising the steps of

(a) providing a porous ion-impermeable polymer substrate;

(b) impregnating the substrate with an ion-conducting polymer; and

(c) stretching the composite substrate to create pores through which a gas can permeate.

Thus, Kindler teaches a method of making an porous composite membrane comprising infiltrating a **preformed** porous substrate with an ion conducting material and then stretching the formed composite membrane to introduce porosity.

Kindler neither discloses nor suggests methods of manufacturing **solid** SPEMs by co-processing (i.e., casting or extruding) a mixture comprising both the ion-conducting material and the substrate polymer.

Arnold merely recites sulfonated polymers and the use of films cast from solutions of such sulfonated polymers in battery applications. Arnold neither discloses nor suggests any methods of producing composite ion-conducting membranes including methods comprising mixing a substrate polymer with the ion-conducting material and then casting or extruding the mixture to form the composite membrane.

Obviousness can only be established by modifying (or combining) the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art [See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992)].

The claims are patentable, for at least the reasons discussed, over the prior art cited in the outstanding office action. Applicants respectfully request reconsideration and withdrawal of the rejection.

Although it is not believed that any additional fees are needed to consider this submission, the Examiner is hereby authorized to charge our deposit account no. 04-1105 should any fee be deemed necessary.

Respectfully submitted,

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John B. Alexander (Reg. No. 48,399)
EDWARDS & ANGELL, LLP
P. O. Box 9169
Boston, MA 02209
Tel: (617) 439-4444
Fax: (617) 439-4170 / 7748